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ALGORITHMS-2: (GATE 2022) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(8) | INCORRECT(5) | SKIPPED(4)

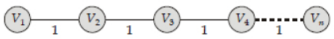
Q. 1 Solution Video | Have any Doubt ?

Consider a weighted complete graph on vertex set $\{V_1, V_2 \ldots V_n\}$ such that weight of the edge (V_i, V_j) is $5|i-j|$. The weight of a minimum spanning tree using Prim's algorithm is

A $n-1$

B $5(n-1)$ — Your answer is **Correct**

Solution :
(b)
Prim's algorithm will pick up the edge with least weight for a particular node such that it does not form a cycle.

$\therefore$ MST will be 

Total $n-1$ edges will be required.
So, weight $= 5(n-1)$

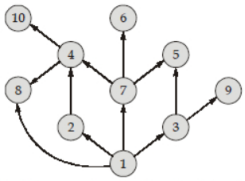
C $5n$

D n^2

QUESTION ANALYTICS +

Q. 2 FAQ | Solution Video | Have any Doubt ?

Consider the following directed graph:



Select the correct option from the following [with respect to the topological ordering].

A 1, 8, 3, 7, 2, 9, 5, 4, 6, 10

B 10, 6, 4, 5, 9, 8, 7, 3, 2, 1

C 1, 2, 3, 7, 4, 6, 9, 8, 5, 10 — Your answer is **Correct**

Solution :
(c)
For topological order, the node should have 0 unselected incoming edges only then it is picked for ordering.
Node 8 cannot be written just after model because of above reason.
(a) → 8, 4 incorrect
(b) → 10, 1 incorrect
(d) → 10, 2 incorrect

D 1, 3, 9, 5, 6, 4, 8, 10, 2

QUESTION ANALYTICS +

Q. 3 FAQ | Solution Video | Have any Doubt ?

Which of the following can be the best algorithm(s) for all pair shortest path problem?
I. 'V' invocations of Dijkstra algorithm ⇒ O(VE logV).
II. 'V' invocations of Bellman-Ford algorithm ⇒ $O(V^2 E)$.
III. '1' invocations of Floyd-Warshall algorithm ⇒ $O(V^3)$.

A I only

B I, II and III only

C II and III only — Your answer is **IN-CORRECT**

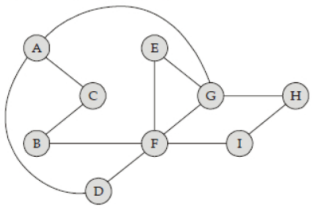
D III only — Correct Option

Solution :
(d)
In case of worst case, i.e. dense graph, E = $O(V^2)$
∴ Time complexities of
I. 'V' invocations of Dijkstra algorithm = $O(V^3 \log V)$.
II. 'V' invocations of Bellman-Ford algorithm = $O(V^4)$.
III. '1' invocations of Floyd-Warshall algorithm = $O(V^3)$.
∴ Floyd-Warshall is best.

QUESTION ANALYTICS +

Q. 4 FAQ | Solution Video | Have any Doubt ?

Consider the following graph:



Consider depth first search algorithm on the above graph. The discover and finishing time of nodes are to be calculated. Select the correct option from the following
[Note: Start with node B]

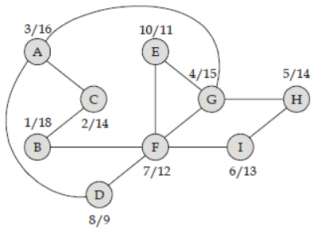
	Discovery time	Finish time
(a) F	7	8
(b) G	4	10
(c) H	5	14
(d) I	6	6

A a

B b

C c — Correct Option

Solution :
(c)



D d

QUESTION ANALYTICS +

Q. 5 FAQ | Solution Video | Have any Doubt ?

Which of the following statement are correct?
S_1 : Linear probing is easy to implement but it suffers from primary clustering.

S_2 : Inserting an element into an open address hash table with load factor α require at least $\frac{1}{1-\alpha}$ probes on average, assuming uniform hashing.

A Only S_1 — Correct Option

Solution :
(a)
- Linear probing suffers from primary clustering.
- Inserting a key require unsuccessful search by placing the key into the first empty slot found.

$$1$$

Thus the expected number of probes is at most $\frac{\hat{}}{1-\alpha}$.

B Both S_1 and S_2 — Your answer is **IN-CORRECT**

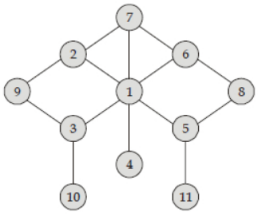
C Only S_2

D None of these

QUESTION ANALYTICS +

Q. 6 ? FAQ | Solution Video | Have any Doubt ?

Find the number of possible BFS ordering for the graph given below. [Starting from node 1]

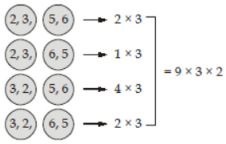


1620 — Correct Option

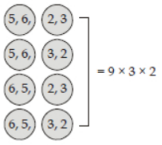
Solution :
1620

Part-I	Part-II
1, 2, 3, 4, 5, 6, 7	8, 9, 10, 11

2, 6 → connected to 1 new node.
3, 5 → connected to 2 new nodes.
7, 4 → connected to 0 new node.
So, 4, 7 can be placed anywhere among Part-I and only 1 way will be there for them in Part-II.
So total ways for placement of 4, 7 = 6 × 5.
Now, maintaining the order



Similarly for



Total ways = 6 × 5 × 3 × 2 × 9 = 1620

Your Answer is 480

QUESTION ANALYTICS +

Q. 7 ? FAQ | Solution Video | Have any Doubt ?

Consider the following matrices with their dimensions:
A → 15 × 20
B → 20 × 10
C → 10 × 25
D → 25 × 15
E → 15 × 500
Apply matrix chain multiplication algorithm to find the minimum number of operations required.

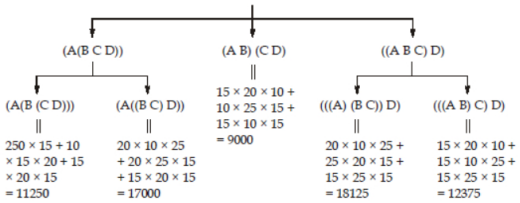
121500 — Correct Option

Solution :
121500

9000 + 112500 = 121500

E → has 500 columns so it should be multiplied only once, in the last.

A B C D



QUESTION ANALYTICS +

Q. 8 ? FAQ ▶ Solution Video Have any Doubt ?

Select the correct statement from the following:

A The largest element in the min heap tree will always occupy a leaf node. Your option is **Correct**

B The worst case height in a binary search tree can be O(n). Your option is **Correct**

C The worst case height in an AVL tree is O(log n). Your option is **Correct**

D Given n elements, a min heap can be created in O(n) time. Your option is **Correct**

YOUR ANSWER - a,b,c,d | CORRECT ANSWER - a,b,c,d | STATUS - ✓

Solution :

(a, b, c, d)
(a) Since the largest element should remain in bottom of the tree, any element less than it will trigger a heapify operation. So the largest element will definitely come to leaf node level.

QUESTION ANALYTICS +

Q. 9 ? FAQ ▶ Solution Video Have any Doubt ?

Select all the correct options:

A Dijkstra's shortest path algorithm always gives the correct output for a directed weighted graph.

B Shortest path between two vertices may change if every edge is increased by the same quantity. Your option is **Correct**

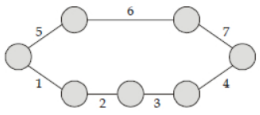
C Bellman Ford algorithm is a dynamic programming based technique. Your option is **Correct**

D Kruskal's algorithm may create disconnected intermediate spanning tree when it is used on an undirected graph. Your option is **Correct**

YOUR ANSWER - b,c,d | CORRECT ANSWER - b,c,d | STATUS - ✓

Solution :

(b, c d)
(a) May give incorrect results for a negative - weighted graph.



(b) add 100 to all edges, the shortest path changes.

QUESTION ANALYTICS +

Q. 10 ? FAQ ▶ Solution Video Have any Doubt ?

Consider a complete graph G with V vertices and E edges. Now, assume two nodes u and v, the shortest distance between them is 8. Assuming that all edge weights are positive, how many such path are possible if atmost 4 edges can be used in the shortest path?

A 180

B 121

C 150

D 165 Correct Option

Solution :
(d)

$$e_1 + e_2 + e_3 + e_4 = 8$$

$${}^{8+4-1}C_{4-1}$$

$$e_1, e_2, e_3, e_4 \geq 0$$

$$= {}^{11}C_3 = \frac{11 \times 10 \times 9}{3 \times 2} = 165$$

QUESTION ANALYTICS +